Solid State Laser Technology Maturation Program

ONR Program Code 35

September 2012

At a Glance

What is it?

- Initiated in 2012, the ONR Solid State Laser Technology Maturation Program will develop and mature high-energy laser technologies into a prototypical weapon system for use and installation on the Navy's surface combatants.

How does it work?

- LASER means "**L**ight **A**mplification by **S**timulated **E**mission of **R**adiation" and specifically, Solid State Lasers utilize specific solid chemicals that when combined with a light source (often LEDs), amplify and focus light at long range.
- For a laser weapon system, the resulting light and heat transmitted to a target causes the failure of structures. SSLs are typically categorized into one of two classes – either slab-type or fiber-type.
- Slab lasers use small centimeter-sized prismatic or rectangular geometries, whereas fiber lasers are thin rods about the diameter of a human hair and many meters long.
- In either type, a SSL weapon utilizes ship's electricity to power the laser, and then the resulting light is directed by mirrors through an external, aimable beam director, where a complex optic system focuses the laser light onto targets.

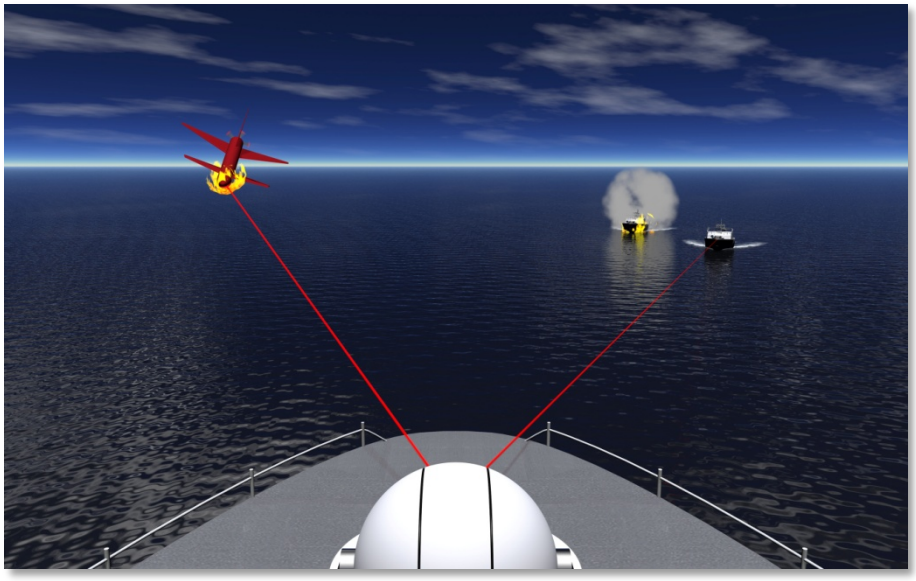
What will it accomplish?

- The SSL-TM Program goal is to produce a prototypical weapon system for use on surface Navy combatants. Lasers have the capability for speed-of-light engagements, with very precise, real-time targeting and battle damage assessments.
- Lasers can provide measured weapon effects, matched with extremely deep magazine capacities to defend against multiple, simultaneous arriving threats potentially posed against Naval surface forces: armed, unarmed ISR or lethal UAVs; light aircraft; small boats; asymmetric surface targets; or small diameter rockets and missiles.
- The prototypes will also examine the utility for precision discrimination of targets, and enhancement in aiming of existing guns and missiles.

Points of Contact

Mr. Peter A. Morrison, ONR Code 352
peter.a.morrison@navy.mil

LCDR Sean Niles, ONR Code 352
sean.niles@navy.mil



The Department of Defense began funding research in high-energy lasers soon after the invention of the laser in 1960 when it was thought that they might (if scalable to high power) have tremendous impact on how wars were fought. In 1973, a new chemical laser technology, based on deuterium fluoride (DF), was determined to be scalable to high power at mid-infrared wavelengths which propagate far better in the atmosphere than other frequencies. The Navy and ARPA then jointly built a multi-hundred-kW class laser, from which the Navy leveraged this technology to produce the nation's first MW-class HEL weapon test bed. The Mid-InfraRed Advanced Chemical Laser (MIRACL) and the SeaLite Beam Director (SLBD) were installed and integrated at White Sands Missile Range in the mid-1980s and used for experiments by DoD. While performance of these MW-class lasers was highly promising with many targets successfully engaged, the logistics and safety issues of hazardous chemicals in a shipboard environment severely hampered further development or implementation on the Navy's surface combatants.

Solid State Laser technology with weapons-level effects has been maturing rapidly, and recent advancements by the scientific and commercial sectors have begun to show that a potential application on surface combatants is possible. In particular, the ONR Maritime Laser Demonstration (MLD) for the first time in 2011 took a laser to sea and successfully conducted a mission scenario against a representative threat small boat, while underway. Further, support for a continuation of competitive programs like LaWS (Laser Weapon System - NSWC Dahlgren), the MLD (Northrop Grumman) and MK 38 TLS (Tactical Laser System, Boeing/BaE) continues to garner interest and generate discussion. The start of the SSL-TM Program has been strongly encouraged by Navy leadership to enhance expertise and develop programmatic focus. A key goal of SSL-TM is to align the S&T program thresholds and objectives with future R&D/acquisition planning processes and requirements, meeting current budgetary constraints. The goal of the SSL-TM Program is to produce multiple demonstration-level events with prototypical quality systems in a competitive environment.

Research Challenges and Opportunities

- Atmospheric propagation of High Energy Laser in a Maritime Environment
- Ruggedized, high-energy, density-tolerant, optical path components
- Compact high-efficiency laser generation technology